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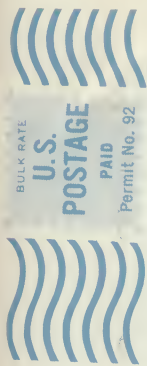


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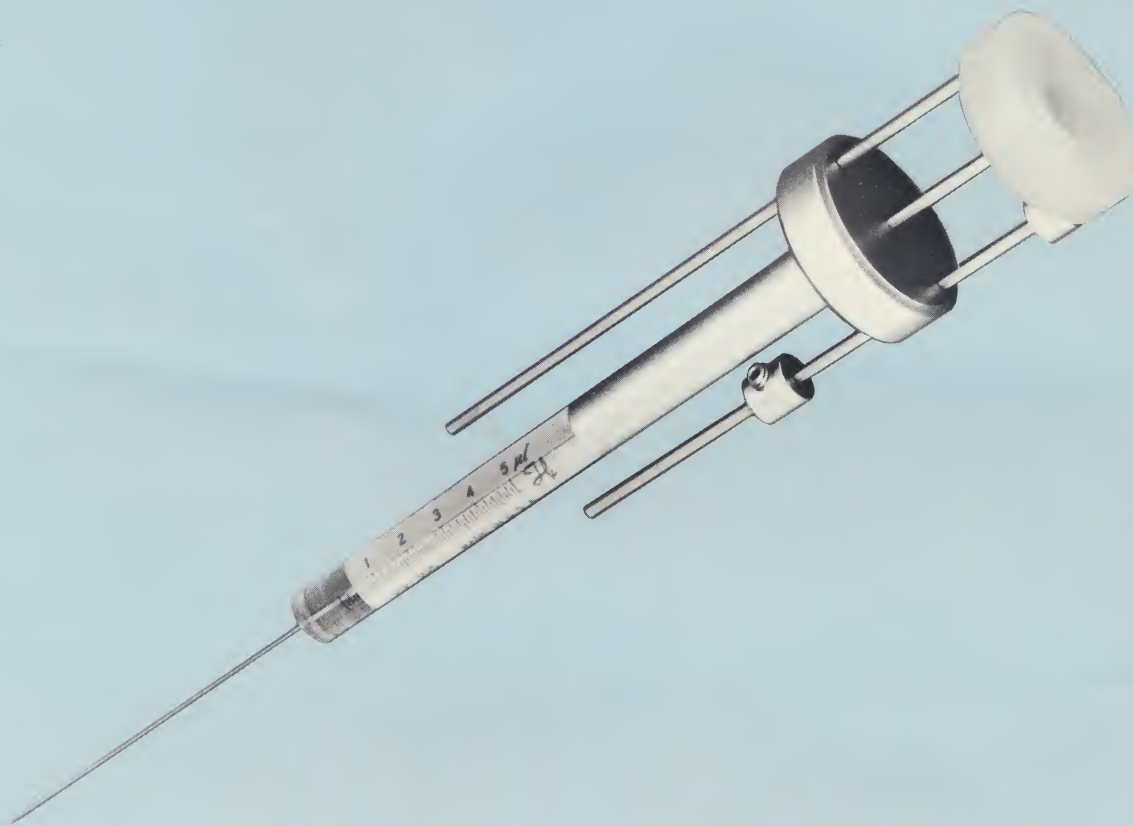


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HAMILTON

HIGH PRESSURE SYRINGE



Hamilton's new High Pressure Syringe (5ul capacity) is designed to inject liquid into high pressure inlet systems. Injection is made in the same manner as with standard G. C. syringes: through the septum, into the inlet, with inlet pressures up to 300 atmospheres. Destructive laboratory tests indicate that the syringe will stand over 6500 PSIG (> 400 atmospheres) before glass breakage. Hamilton's HP305N syringe is guaranteed to 300 atmospheres pressure (with liquid in the syringe) with virtually no liquid blow-by or loss of sample due to leakage when using a generally accepted G. C. injection procedure.

The HP305N is constructed of a precision bore glass barrel that is reinforced by a metal extension and a precisely fitted stainless steel plunger. Extra plunger support is gained by a guide device and a heavier plunger body at the button end. The guide assembly has positive stops in both directions of plunger travel to reduce the possibility of plunger bending. It also prevents the plunger from blowing out of the barrel.

The HP305N is available in a 5 microliter capacity only, with a permanently affixed needle. The standard needle is a 26 special gauge of .0185" o.d., .0045" i.d., 2 inches long, electrolytically tapered and 17° bent point for ease of septum penetration. A slightly stiffer needle may be ordered as an alternate that is 22 special gauge (.028" o.d. x .006" i.d.) electrolytically tapered to .014" at the tip end.

HP305N High Pressure Syringe, 5ul capacity, \$45.00

Available through authorized dealers or direct. Price is FOB destination via Parcel Post within The United States and possessions. Price subject to change without notice.

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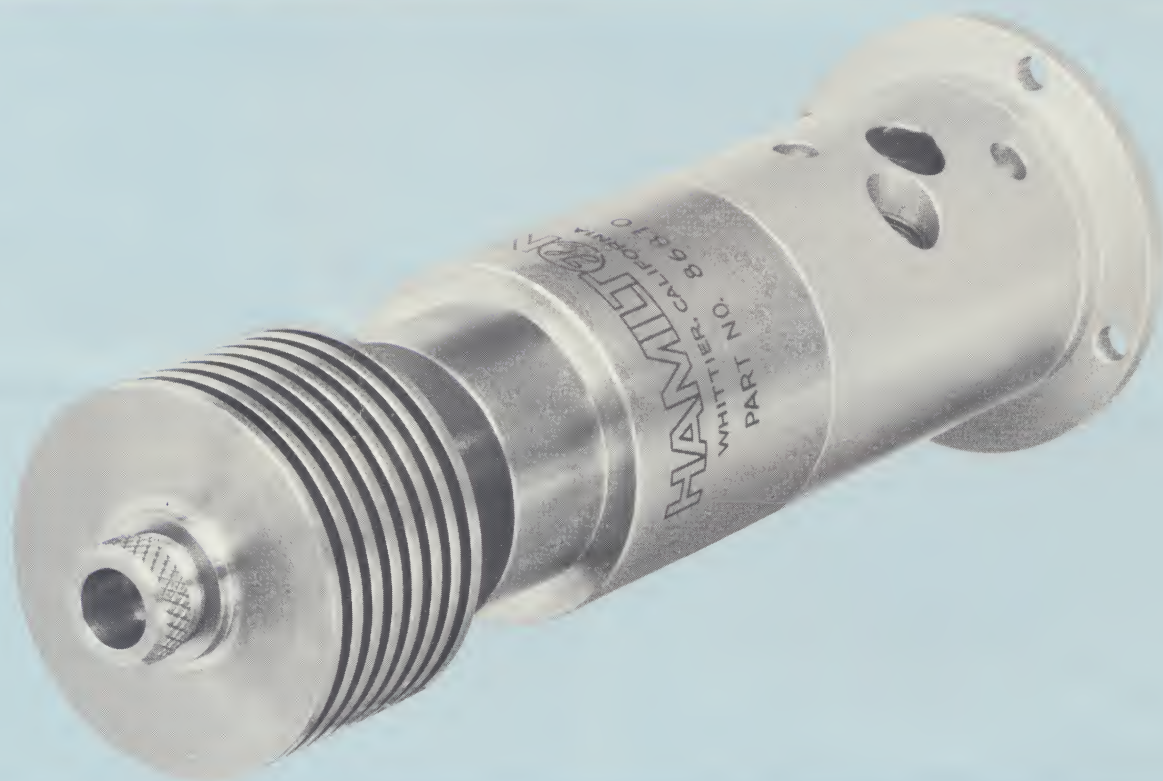
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PRECOLUMN INLET



The Hamilton Precolumn Inlet was designed for direct sampling on high resolution packed and capillary columns and is a valuable accessory which may be installed into any gas chromatograph. Its unique design enables direct introduction of small sample quantities (e.g., 10^{-6} grams) as required by high resolution columns. The entire injected amount of sample is fed as a narrow plug of true composition to the column with no portion of the sample material being lost as in the conventional splitting procedure.

Principle of Operation—The discrepancy between the allowed minute sample size for a capillary column and the smallest amount which can be reproducibly handled by a microliter syringe is bridged by diluting the sample in an appropriate solvent. A volatile sample boiling below 350°C is diluted in a non volatile solvent (e.g. high purity silicone oil) and the high boiling samples are dissolved in a suitable volatile solvent. The diluted sample is then gathered into a syringe and introduced into the small packed glass precolumn of the Inlet. The glass precolumn is maintained at a suitable temperature and the volatile sample evaporates from the silicone oil, and is fed into the column leaving the residual silicone oil on the packed precolumn. The high boiling samples are moved along with the solvent directly to the column.

Features of the Hamilton Precolumn Inlet—The upper body of the Inlet is divided into two sections, a cool zone where the silicone rubber septa are contained, and a hot zone containing the packed precolumn glass capillary.

The temperature difference between zones is controllable by adjusting the amount of forced air cooling at the septum retaining zone.

Because of the cooling capability of this section, the silicone rubber septums last longer than in other high temperature injection systems. Even when the temperature in the high temperature zone of the block is as high as 400°C , the temperature of the septum retaining block may be controlled to as low as 50°C when maximum air cooling is used.

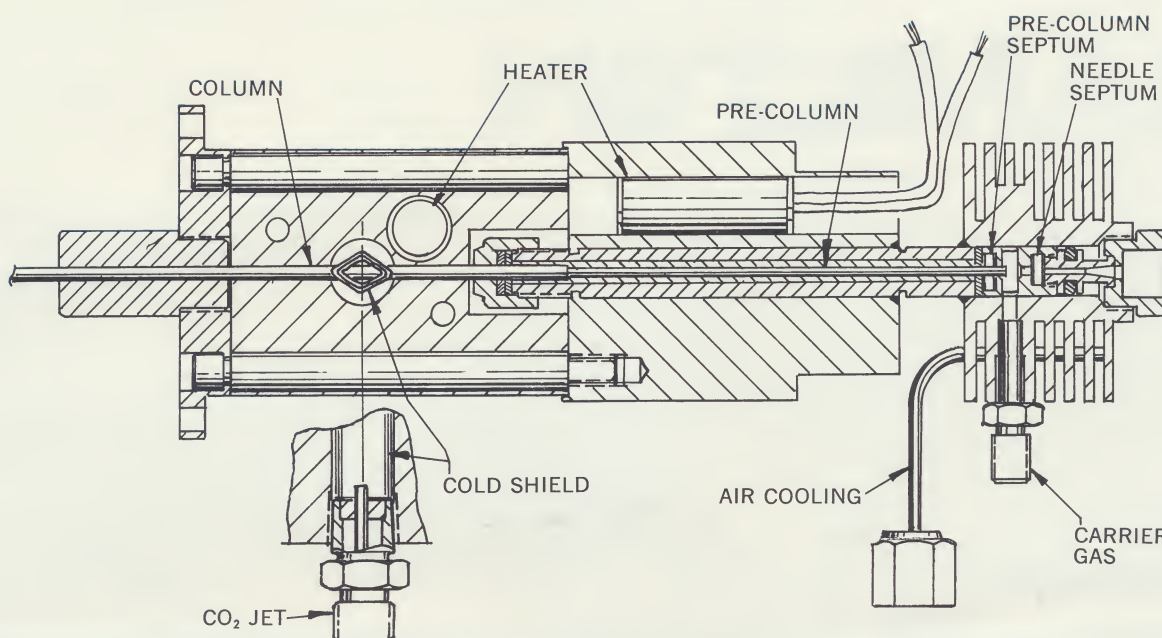
As mentioned previously, the diluted sample is introduced with a microliter syringe on the small packed glass precolumn. The i.d. of the packed precolumn ($0.025''$) is made as small as possible, and still accommodates the standard size G. C. syringe needles, such as on the Hamilton 701N. The arrangement of silicone rubber sealings forces the carrier gas to flow through the packed precolumn with a high linear gas velocity.

The connection of the precolumn to the capillary column is made with an adapter that minimizes dead space. By changing the lower body and adapter the Inlet may be made to accommodate $\frac{1}{8}''$ o.d. columns and also be used for on column injections.

The precolumn assembly also includes a refrigeration device at the lower part of the unit. By using CO_2 or other suitable refrigerants, the sample components are trapped in a narrow zone at the very top of the chromatographic column. When the cooling fluid is turned off the zone rapidly heats and releases the sample as a slug into the column.

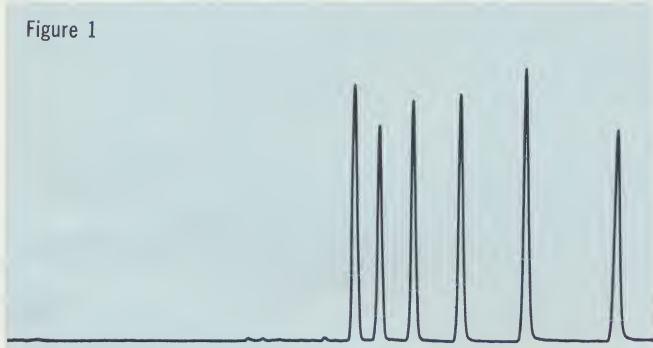
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HAMILTON PRECOLUMN INLET



APPLICATIONS

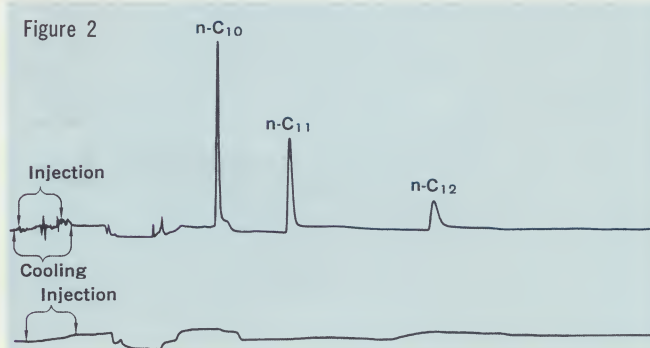
Figure 1



Among the applications of the Precolumn Inlet System, are the direct injection of a sample solved in an involatile solvent e.g. silicone oil as demonstrated in Figure 1: Sample, 0.2ul solutions of 1% n-C₁₁ to n-C₁₆ in silicone oil; Column, Length 80' x 0.01" i.d. coated with silicone oil, temperature 220°C; Refrigeration, 20 seconds with CO₂. The refrigeration device can also act as a concentrator for trace components by trapping them in a narrow zone at the head of the column.

The chromatograms shown in Figure 2 represent an analysis of air contaminated with some 4 p.p.m. n-decane, n-undecane, and n-dodecane. In

Figure 2



both chromatograms 2.5ml of contaminated air were introduced over a period of one minute. In case 1, the n-paraffins were trapped in the top of the capillary column with the refrigeration device described above. All other conditions were the same in chromatogram 2. The column used was an 80' x 0.01" i.d. capillary column coated with SE-30. Column temperature 150°C.

The above applications demonstrate the uniqueness of the Precolumn Inlet. Among others not cited, high boiling samples such as steroids can be dissolved in a volatile solvent and introduced into a chromatograph in minute volumes. With the minimal dead volume of the Inlet, direct injection of gases can also be made to capillary columns.

ORDERING INFORMATION

86815	Hamilton Precolumn Inlet complete	
	including parts listed below	\$350.00
30618	Glass Precolumn (100 pcs.)	12.00
30620	Septum Precolumn (pkg. doz)	12.60

76001	Septum Needle (pkg. doz)	3.60
19087	Glass wool (5gms)	1.00
30622	Silicone oil, ultra pure (25gms)	12.50
30619	Packing chromosorb P 60/80 mesh (5gms)	1.50

Available through authorized dealers or direct. Prices F.O.B. destination via Parcel Post within the United States and possessions. Prices subject to change without notice.

PRECISION MEASURING EQUIPMENT FOR CHEMICAL AND CLINICAL RESEARCH

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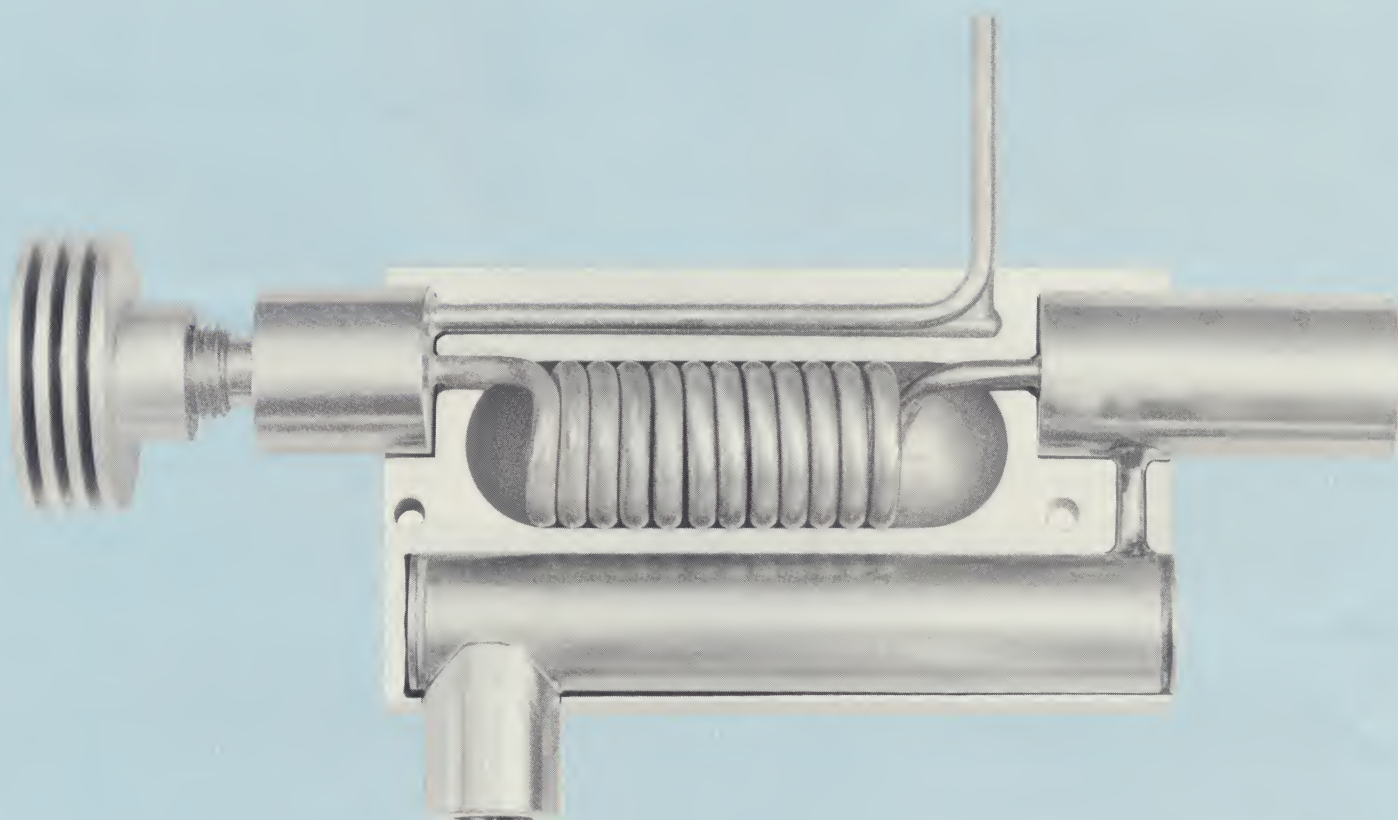
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INLET SPLITTER



Hamilton's new Inlet Splitter for gas chromatography is designed for use with capillary or high resolution columns. It provides a method of using the relatively large volume reproducibility of a microliter syringe, and splitting it to the nanoliter range necessary for the column. The overall mechanical design enables the splitting of a representative sample without fractionating sample components.

Since most splitters tend to unequally inject various components of a sample onto the column, all factors which could possibly effect a nonlinearity in sample diversion have been considered.

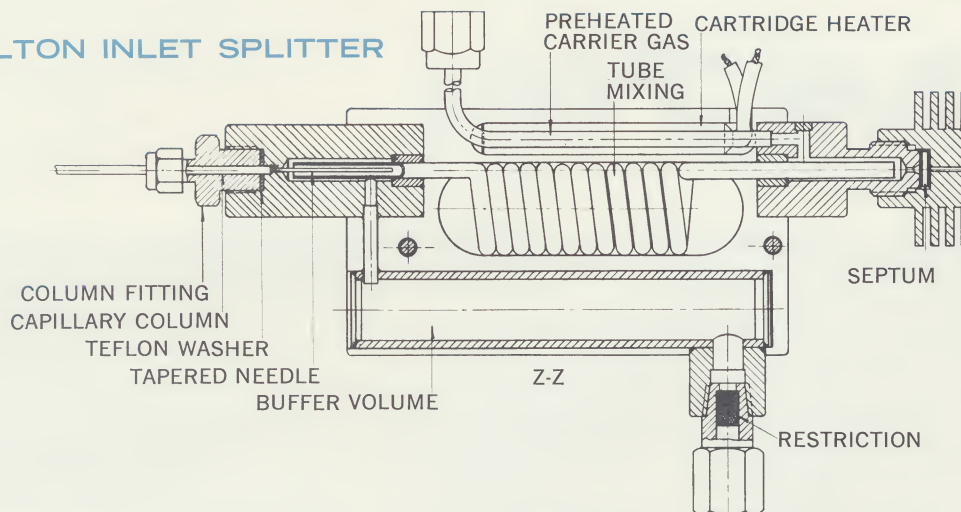
The extended splitting needle and smooth walls of the inlet at the split point minimize fractionation errors due to turbulence, or the so-called "suction effect" inside the column. The mixing tube is of computed length to assure

proper and thorough cross sectional mixing. Calculations of length and diameter of the mixing tube show that lateral concentration gradients are small enough at the splitting point as not to affect the split ratio. A buffer volume is used to prevent nonlinear splitting due to viscosity changes at the restrictor. If the excess sample and carrier mixture reach the restrictor before all the sample has passed the splitting point, the change in gas viscosity will change the by-pass flow and therefore the split ratio.

Other considerations for proper introduction of sample into the column have been made. The sample is quickly vaporized by internal heaters and carried to the column as a narrow injection peak. Preheated carrier gas protects against back diffusion of sample at the inlet, thus assuring minimal band spreading. The design throughout makes use of smooth internal surfaces with no unswept dead volumes.

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HAMILTON INLET SPLITTER

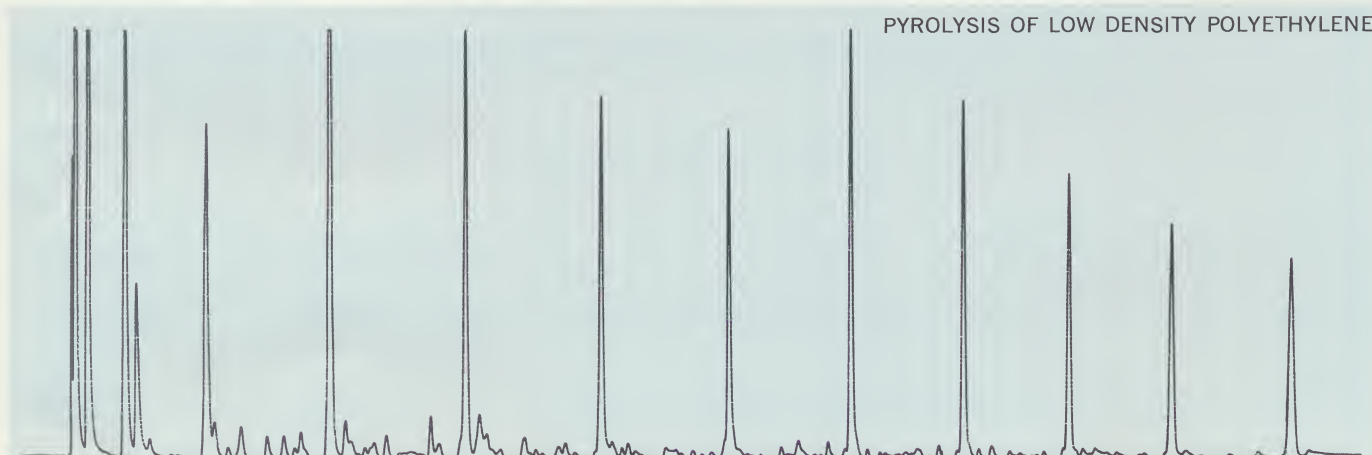


number of measurements	SPLITTER	KNOWN COMPOSITION
	5	—
n-C ₉ M %	24.24	24.38
σ rel %	0.21	—
n-C ₁₀ M	24.87	24.72
σ rel %	0.29	—

The above table illustrates the reliability of the Hamilton Inlet Splitter for quantitative analysis. The composition of the test

number of measurements	SPLITTER	KNOWN COMPOSITION
	5	—
n-C ₁₁ M	25.34	25.22
σ rel %	0.20	—
n-C ₁₂ M	25.55	25.68
σ rel %	0.21	—

sample in % W/W was known with a high degree of accuracy.



Normally poor pyrograms yield excellent separation using the high resolution characteristics of capillary columns. The sharpness of the peaks indicates little band spreading occurred in the inlet or during pyrolysis in Hamilton's Multi Purpose Sampler.

ORDERING INFORMATION

86820 Hamilton Inlet Splitter complete, Includes:
Splitter, Column fittings, mounting
brackets, 12 septums, choice of restrictor
(100:1 standard), and Teflon column. \$200.00

30420 Restrictor (250:1)	14.00
30421 Restrictor (100:1)	14.00
30418 Teflon Washer for Column Adaptor	1.50
76002 Septums (1 dozen)	3.60

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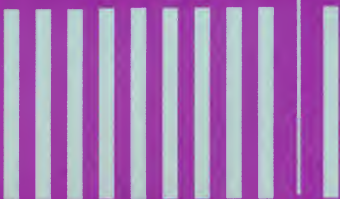
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**THREE
NEW
PRODUCTS
FROM
HAMILTON**

Here are the first of what we expect to be several supplements to the Hamilton H68 catalog. These new products—two unique inlets and a high pressure syringe—expand Hamilton's line of precise fluid measuring and dispensing devices for chemical and medical research. *For additional information or an extra copy of our catalog, please use the attached card.*



To : Hamilton Company

Attn : John Nadolny

- ☐ Please send me a copy of your complete line CATALOG H68.
- ☐ I'd like the following specific information about your new product
- ☐ Precolumn Inlet, ☐ Inlet Splitter, ☐ High Pressure Syringe :

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